NASA SBIR/STTR Technologies
Spaceflight Urine Analysis System
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Identification and Significance of Innovation

- NASA has identified loss of weight-bearing bone as a high priority problem with serious consequences during long-duration spaceflight
- Urinary calcium monitoring provides a non-invasive biomarker that provides immediate feedback on calcium loss and can predict risk of kidney stone formation
- Creare Urine Analysis System provides automated, transparent monitoring of calcium loss in each void, and tabulation of total calcium loss for each astronaut
- Flow-through operation provides simple integration with the ISS UMS, good control, and on-line calibration

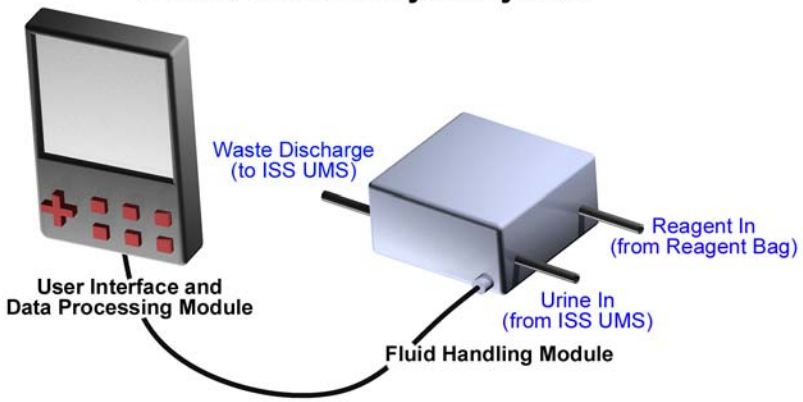
Technical Objectives

- Develop automated urinary calcium system using spectrophotometry (accuracy and repeatability of spectrophotometry validated in Phase I comparison with measurements made by clinical chemistry laboratory)
- Build engineering prototype unit suitable for integration with ISS UMS
- Develop techniques to ensure that measurements are reliable in the presence of two-phase urine stream (two approaches identified during Phase I)

Work Plan

- Finalize design and fabricate engineering prototype unit
- Develop calibration protocol for spaceflight use
- Construct ISS UMS mockup (Hamilton Sundstrand)
- Integrate engineering prototype with ISS UMS mockup
- Validate accuracy and repeatability via 24-hour urinary calcium loss human subject test conducted by Dr. Jay Buckey (Dartmouth Medical School)

Creare Urine Analysis System



NASA Applications

- Automated measurement of urinary calcium loss during spaceflight for evaluation of bone loss, monitoring of countermeasure efficacy, and assessment of risk for renal stone formation

Non-NASA Applications

- Home-based automated monitoring of urinary calcium loss in patients suffering from osteoporosis
- Current techniques are not suitable for continual monitoring in the home, are expensive, and suffer from long latencies between physiological changes and changes in measurement.

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